

USAF Training Equipment Characteristics

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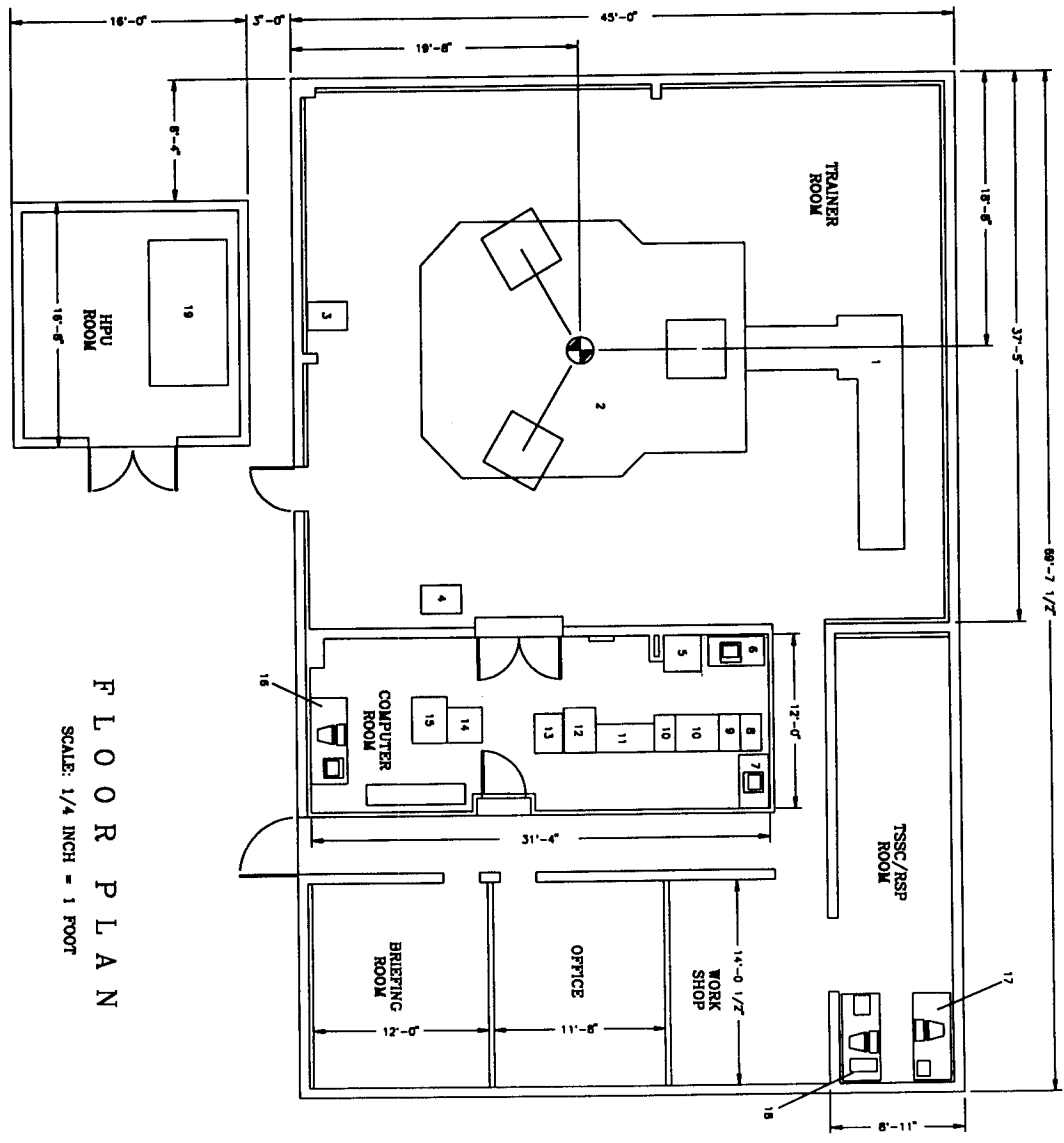
OPERATIONAL FLIGHT TRAINER (OFT)
COMPUTER RESOURCES REPLACEMENT (CRR)

CHESAPEAKE SYSTEMS
INTEGRATION INC.

RC-135W AIRCRAFT, TYPE A/F37A-T72

RC-135W (TYPE A/F37A-T72)

- | ITEM | NOMENCLATURE |
|------|--------------------------------|
| 1 | ACCESS STAIR/ RAMP ASSY |
| 2 | COCKPIT/MOTION BASE ASSY |
| 3 | MOTION CABINET |
| 4 | VISUAL DISPLAY POWER CABINET |
| 5 | VISUAL DEVELOPMENT DISPLAY |
| 6 | VISUAL ASR 700 SILENT TERMINAL |
| 7 | VISUAL ASR 700 SILENT TERMINAL |
| 8 | VISUAL 4014 TERMINAL |
| 9 | VISUAL DEVELOPMENT SYSTEM |
| 10 | VISUAL O/C CABINET |
| 11 | I/O CABINET |
| 12 | POWER CONTROLLER CABINET |
| 13 | SOUND CABINET |
| 14 | PRINTED CIRCUIT LINE PRINTER |
| 15 | R/T 380 INFINITY HOST COMPUTER |
| 16 | SYSTEMS CONSOLE |
| 17 | LOTUS NOTES SERVER |
| 18 | TSSC WORK STATION |
| 19 | HYDRAULIC POWER UNIT |



FLOOR PLAN
SCALE: 1/4 INCH = 1 FOOT

AIR CONTROL

The Operational Flight Trainer (OFT) facility air conditioning requirements are the responsibility of the Government. Total heat rejection for a single trainer equipment complement is approximately 141,000 BTU/m.

The computer and simulator rooms should be maintained at 65 degrees to 75 degrees F dry bulb at a relative humidity of 45 to 55 percent noncondensing. (continued)

MISSION & DESCRIPTION

The principal mission of the RC-135W Operational Flight Trainer (OFT) is to provide initial, continuation, and proficiency training for pilots and copilots in the normal, abnormal, and emergency operating procedures of the RC-135W aircraft. This includes taxi takeoff, landing and inflight refueling. The OFT provides a replica of a RC-135W cockpit with realistically simulated flight performance, aircraft systems, instrumentation, motion cues, primary flight controls, engine performance, and visual scenes. Computer control of these functions assures synchronization with a very high degree of fidelity. This, combined with instructor control of variable functions and malfunctions provides the aircrew with a realistic portrayal of actual aircraft characteristics in the air and during ground operations. (continued)

AUXILIARY EQUIPMENT

The following limitation apply to the RC-135W OFT capabilities:

LIMITED SIMULATION

- Air Conditioning
- Pressurization
- Interphone System
- Emergency Gear Extensions
- Autopilot

NO SIMULATION

- CPI Panel
- VHF, HF, UHF COMM
- SATCOM

(continued)

AUXILIARY POWER

Emergency lighting is facility provided by battery powered units. This lighting is provided over the simulator ingress/egress ramp as well as in the computer and hydraulic pump rooms. A separate battery unit within the cockpit provides emergency lighting for the cockpit and instructor station.

A battery emergency power source is facility provided for lowering the cockpit ramp.

ELECTRICAL REQUIREMENTS

Power Approximately 150 KVA @ 85% power factor (does not include facility power, lighting, or air conditioning).

Voltage 120/208 & 277/480 Volts ($\pm 10\%$) 4-wire wye-connected with ground.

Frequency 60 Hertz ± 5 Percent.

Current Approximately 185 amperes per phase at 277/480 volts; Approximately 108 amperes per phase at 120/208 volts.

Phase 3 phase, wye-connected.

Power Receptacle None; all leads connect to pressure lugs in respective facility power distribution panel. (continued)

GFE ITEMS

The following Government Furnished Items are being used on the RC-135W OFT:

FSAS Control Unit
SN 5895X0603644600

FSAS Display Unit
SN 5895X0658644600

FSAS Processor
SN 5895X0657764600

MAINTENANCE EQUIPMENT

The Operational Flight Trainer has a complete set of diagnostic programs to fully test the operation of the computational hardware system and peripherals. When a malfunction occurs in the computer or simulator equipment, these programs provide sufficient information to identify and locate the malfunction.

SIZE & WEIGHT

Number of Sections 20

Largest and 168 in. wide X
Heaviest Unit 88 in. Deep X
(uncrated) 95 in. High;
1500 lbs. (cockpit section)

Total Weight of (Approx)
Trainer (uncrated) 23,000 lbs.

Recommended 50' x 50' x 32'
Simulator Room
Size and Ceiling Height(continued)

TECHNICAL PUBLICATION

510-71
Operation and Maintenance
Manual

510-73
Instructor's Utilization Handbook

COTS Vendor Manuals and
Documentation

SPECIAL DATA

Water is required to cool the hydraulic pumping unit's hydraulic fluid.

A halon fire suppression system is installed in the RC-135W OFT to protect the cockpit, support structure and visual display unit in the event of an actual fire. It is not a simulated system. Detectors are installed with cross-zoned control for halon release. Activation of any detector will shut down trainer power and sound the appropriate warning alarms in addition to starting the halon release cycle.

COMPUTATION SYSTEM CHARACTERISTICS AND DESCRIPTIONS

| HARDWARE | SOFTWARE |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The RC-135W OFT employs the Encore Infinity R/T 380 computer system. The Infinity system is comprised of a RSX as the host computer, with an ALPHA AXP processor for TSSC and configuration management environment. The primary interface between the two processors is achieved by reflective memory. The RSX is the real-time simulation host and the ALPHA AXP is a closely coupled support system.</p> <p>Peripheral equipment includes one LINK MCB maintenance console for the RSX, an X-terminal for the ALPHA AXP, a CD ROM drive, two 2 GB disk drives, 4 mm DAT tape drive and a QIC tape drive.</p> | <p>The trainer software, which employs assembler and FORTRAN programming languages, uses a total of approximately 30 meg words, which are stored on DISC.</p> <p>Approximately 281 software modules are employed in the following organization:</p> <ul style="list-style-type: none"> (a) Maintenance Programs (b) Operating System (c) Utility Programs (d) Trainer Utility Programs (e) Trainer Simulation Programs (f) Trainer Data Libraries <p>The RC-135W OFT storage operates under MPX 32 V.3.6.</p> <p>Encore FORTRAN 77 and Scientific Run Library, as well as the MPX32 Utilities Program Development Environment, are used in the Trainer System Support Center (TSSC).</p> |

INSTRUCTOR/OPERATOR STATION

The Instructor Station is located aft of the student station. It consists of a CRT display, simulation control panels, interphone communication controls, area lighting controls and emergency shut-off controls.

The instructor station provides the instructor with the ability, for both basic air work and refueling, to monitor the flight, control the training and insert malfunctions.

The IOS is configured to provide the instructor with maximum control of this training with a minimum of interaction with the instructor station. The two simulation control panels provide immediate access to certain functions, including line selection from the CRT page on display. The basic panel, or instructor's keyboard provides general training controls, freeze controls, repositioning, variable data entry, slew controls for the RC-135, line select, malfunction page selection and insertion and other page selections.

MOTION SYSTEM DESCRIPTION

A six-degree-of-freedom motion system is provided for the cockpit as an internal part of the simulator system. The motion platform, to which the cockpit is attached, is supported by six (6) identical hydraulic actuators arranged in three (3) bipod panels. All six (6) actuators are driven in concert to produce real-time dynamic motion cues in six (6) degrees of freedom in response to computer commands.

| EXCURSION | VELOCITY |
|----------------------------|------------|
| Vertical +33 in, -38 in | 24 in/sec |
| Lateral ±58 in | 24 in/sec |
| Longitudinal ±53 in | 24 in/sec |
| Pitch +36 in, -32 in | 20 deg/sec |
| Roll ±32 deg | 20 deg/sec |
| Yaw ±32 deg | 20 deg/sec |

A 75 Hp, 220 GPM Hydraulic pump is provided for the motion system.

VISUAL SYSTEM DESCRIPTION

The RC-135W OFT employs an Evans & Sutherland NDVDVIEW SPI, a 3 channel night and dusk visual system.

This visual system is a computer image generation (CIG) system that provides realistic training for night and dusk ambient light levels. This system has the capability of generating visual cues in color and representing them through virtual image displays. The virtual image displays are a multicolor ray tube (CRT) display visual system for large field-of-view (FOV) application, providing a minimum of four (4) operational windows and three (3) image-generating channels, supplying information to four (4) separate eyepoint positions.

COCKPIT SYSTEM DESCRIPTION

The RC-135W OFT cockpit is mounted on a six-degree-of-freedom motion system and contains aircrew student stations for both the pilot and copilot.

The RC-135W OFT cockpit portrays the design-basis aircraft interior that is visible to the aircrew students in their normal seat positions. All instruments, indicators, controls, lights, switches, placards, and other aircraft furnishings, including seats, are duplicated in type, position and finish and are appropriately marked as in the design-basis aircraft.

The right aft portion of the cockpit is modified in order to accommodate the onboard instructor station.

AIR CONTROL (Continued)

The office areas should be maintained at 60 degrees to 95 degrees F dry bulb at a relative humidity of 40 to 70 percent noncondensing. These recommended room ambient should be maintained during normal operation and shutdown periods of the trainer.

This conditioned air should be filtered. The degree of filtration should be equivalent to that achieved by a replaceable day media filter of an NBS efficiency of 40 percent.

In the computer room, the underside of the elevated computer flooring functions as an air conditioning plenum and is supplied by the facility air conditioning system. The electronic cabinets in this room are fitted with exhaust fans and filters. Conditioned air from underneath the elevated flooring is drawn into the bottoms of the equipment cabinets, and is exhausted from the tops of the cabinets.

The cockpit is cooled by a separate air conditioning unit mounted just outside the simulator bay wall in close proximity to the cockpit. This conditioned air is routed into the cockpit via a 12-inch diameter flexible duct that is furnished as part of the flight station.

Radiated heat load summary, to these figures add approximately 550 BTU per person within applicable room:

| | |
|--------------------|-------------|
| Computer Room..... | 215,115 BTU |
| Simulator Bay..... | 113,108 BTU |
| Office Areas..... | 75,000 BTU |
| TOTAL..... | 403,223 BTU |

MISSION & DESCRIPTION (Continued)

The instructor is accommodated on board aft of the student station and is provided with system training program indications that provide the instructor with the ability to monitor the flight, control the training, and insert/clear malfunctions.

The trainer's object, through the medium of instruments, motion, visual, and control feel indications, is to provide for the training of aircrew personnel in the operational use of the PC-135W aircraft for taxi, takeoff, landing, and air refueling events. Training for these events is accomplished under varying conditions in optimum and degraded weather conditions including crosswind, fog, clouds, broken/jagged ceiling, gusts, turbulence and ice. Sufficient high fidelity is provided to perform critical stress flight maneuvers associated with training events such as all weather approaches, asymmetrical thrust, departure from controlled flight, maximum performance maneuvers, and crosswind landings.

AUXILIARY EQUIPMENT (Continued)

NO SIMULATION (Cont'd)

- Oxygen
- Fuel Temperature
- Radar Scope

ELECTRICAL REQUIREMENTS (Continued)

Inter-Unit Cabling..... Laced cables installed in cable trays and under elevated flooring.

Batteries Required..... Building emergency light units are facility supplied. Batteries are also provided for the fire detection system, and the cockpit emergency lighting.

Electrical Outlets..... Facility utility power circuits are required.

Lighting Arrangement..... Overhead room lighting is provided by the facility. The lighting level is 50 foot candles with the following exceptions:

Computer Room:

100 foot candles

Cockpit:

Lighting is provided as in the actual aircraft except that overhead lighting fixtures are added behind the student positions for maintenance and safety.

ELECTRICAL SUMMARY

| <u>CIRCUIT</u> | <u>POWER</u> | <u>VOLTS</u> | <u>G/B</u> | <u>PHASE</u> | <u>WIRE SIZE (AVG)</u> |
|--------------------------------|--------------|--------------|------------|--------------|-------------------------------|
| Cockpit Air Conditioner | 8 KVA | 208 | 20 Amp | 3 | No. 10 with Gnd |
| Simulator | 79 KVA | 208 | 300 Amp | 3 | No. 410 with No. 1 Gnd (pair) |
| Hydraulic Pump | 91 KVA | 480 | 225 Amp | 3 | No. 410 with No. 6 Gnd |
| Hydraulic Control Loading Pump | 20 KVA | 480 | 50 Amp | 3 | No. 10 with Gnd |

SIZE & WEIGHT (Continued)

| | |
|--------------------------------------------------------|----------------------------------------------------|
| Recommended Computer Room Size and Ceiling Height..... | 15' x 30' x 8½' |
| Recommended Hydraulic Pump Room Size..... | 12' x 15' x 10' |
| Minimum Door Opening..... | 16 x 16 Foot Removable Exterior Wall Panel Opening |
| Maximum Distributed Floor Load..... | 9350 lb/sq ft (Motion Platform) |

TRAINING SYSTEM SUPPORT CENTER (TSSC)

| HARDWARE | SOFTWARE |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The RC-135W OFT TSSC will use the ALPHA AXP processor of the Encore Infinity R/T 380 for TSSC data and configuration management tasks. The primary interface between the ALPHA and the TSSC workstation is by an IEEE 802.3 ethernet interface. This interface is connected to a TCP/IP network that includes the TSSC workstation used as an X-terminal. The 2 GB hard drive on the ALPHA is used to maintain all the software development tools. Software Development Library and the CM archive database. The 4 Gbyte DAT tape drive of the ALPHA will be used for TSSC system administration functions such as back up and system restoration.</p> <p>The TSSC workstation consists of a Pentium 120 Mhz PC with 32 MB RAM, 1.2 Gbyte hard drive, CD Rom, and 17" monitor. Peripherals include a Laserjet HP 4 MP, RELSYS VM4540 scanner and a SUMMAGRAHICS 7100 plotter. The server is a 90 Mhz Pentium PC with a 1 GB hard drive, 2 GB tape back-up, FAX/modem card and 17" monitor.</p> | <p>The ALPHA AXP processor uses an UNIX based operating system with a variety of text editors. These editors allow the editing of the simulation source files as well as commercially obtained source files. The editors provided with the ALPHA include "ed," "vi," "emacs," and "FUSE Editor."</p> <p>The following is a list of the TSSC development tools:</p> <p>"FORTRAN 77+" Compiler capable of generating RSX compatible software</p> <p>"MPX 32 UTILITIES" A standard set of program development utilities to assist in producing software. They include macro assembler, cataloger, source update utility, Datapool Editor, Macro Library Editor and Subroutine Library Editor.</p> <p>"DRTX" DRTX provides the transparent window between the ALPHA and the RSX for software development activities.</p> <p>"TCP/IP" TCP/IP is the ethernet protocol that provides the LAN access for the ALPHA.</p> <p>"AID" The Automatic Interactive Debugger is a complete debug system with source level FORTRAN interface.</p> <p>"FUSE" FUSE is an X-windows based software product that provides a graphical (Motif) interface to a integrated suite of workstation based tools [i.e. Editor, Call Graphic Browser, Profiler, Cross-Reference and Code Manager].</p> |